

## ABSTRACT FOR SPRING 1995 MRS MEETING

Submitted to Symposium G

Symposium Title: Structure and Properties of Multilayered Thin Films



**SOLID STATE REACTION OF Al AND Zr IN Al/Zr MULTILAYERS: A CALORIMETRY STUDY**, K.J. Blobaum\*, T.P. Weihs, T.W. Barbee, Jr. and M.A. Wall, Chemistry and Materials Science Department, Lawrence Livermore National Laboratory, Livermore, CA, 94551, \*now at Materials Science Program, University of Wisconsin-Madison, Madison, WI, 53706

The exothermic, solid state reaction of Al and Zr has been studied in thick Al/Zr multilayers using Differential Scanning Calorimetry (DSC) and X-ray diffraction (XRD). The multilayer samples were magnetron sputter deposited into alternate layers of Al and Zr that range in thickness from 46Å to 290Å. The total film thicknesses range from 16µm to 47µm. When the samples were isochronally scanned in temperature from 25°C to 725°C, a large, broad exotherm at ~350°C was followed by one or two smaller exotherms at ~650°C. The first exotherm is dominated by a diffusion based reaction of Al and Zr, and it is the analysis of this reaction that is reported. The observed exothermic heat is measured using isochronal scans and isothermal anneals, and the heat is analyzed using a 1-D diffusion based model. Average activation energies and diffusion constants are determined from this analysis. In the isothermal scans, the total exothermic heat increases linearly with (time)<sup>0.5</sup>. Variations of layer thicknesses and lattice constants that were measured using XRD of the elemental layers suggest that Zr is the dominant diffusing species in these samples.

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